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PATENT APPLICATION

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Inventor(s): Martin F. Arlitt et al

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Title: CONTENT CONSISTENCY IN A DATA ACCESS NETWORK SYSTEM

Confirmation No.: 5764

Examiner: Isaac Woo

Group Art Unit: 2172

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PO Box 1450
Alexandria, VA 22313-1450

TRANSMITTAL OF APPEAL BRIEF

Sir:

Transmitted herewith is the Appeal Brief in this application with respect to the Notice of Appeal filed on __July 28, 2004__ .

The fee for filing this Appeal Brief is (37 CFR 1.17(c)) $340.00.

(complete (a) or (b) as applicable)

The proceedings herein are for a patent application and the provisions of 37 CFR 1.136(a) apply.

(X) (a) Applicant petitions for an extension of time under 37 CFR 1.136 (fees: 37 CFR 1.17(a)-(d) for the total number of months checked below:

(X) one month	$110.00	
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( ) The extension fee has already been filled in this application.

( ) (b) Applicant believes that no extension of time is required. However, this conditional petition is being made to provide for the possibility that applicant has inadvertently overlooked the need for a petition and fee for extension of time.

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Date: October 28, 2004

I hereby certify that this document is being filed by personal delivery to the Customer Service Window, Crystal Plaza 2, 2011 South Clark Place, Arlington, Virginia, of the United States Patent & Trademark Office on the date indicated above.

By: _____ Reg. No. 47,248
(Attorney Signature and Reg. No.)

Respectfully submitted,

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I.   Real Party in Interest

The present application is assigned to Hewlett-Packard Company, who is the real party of interest.

II.   Related Appeals and Interferences

There are no other prior or pending appeals, interferences or judicial proceedings known to Appellants, Appellants' legal representative, or the assignee which may be related to, directly affect or be directly affected by, or have a bearing on the Board's decision in this appeal.

III.   Status of Claims

The application contains claims 1-7, all of which are currently pending and stand finally rejected. Claims 1-7 form the basis for this appeal.

IV.   Status of Amendments

There were no amendments filed subsequent to the final Office Action.

V.   Summary of Claimed Subject Matter

The present invention is generally directed to data access network systems, such as the Internet or intranet systems, and more particularly to improving content consistency between a proxy server and a content server in a data access network system.

As described in the background portion of Appellants' specification starting at page 2, line 21, it is known to use a proxy server to cache objects received from a remote content server. For example, Figure 1 shows a prior art system in which a user terminal 12 requests an object 10 stored in a remote server 18. The system includes an intermediate server 14 that includes a proxy server 16. When the proxy server 16 receives a request for an object, the proxy first checks whether the object is present in its cache. If the object is not present in the cache, the proxy server 16 forwards the request to the remote server 18 via the network 20. The remote server then directs the requested object 10 to the client via the proxy server 16. During the process, the object 10 is also cached in the proxy server 16.

When the object 10 is again requested, the proxy server 16 will find the object in its cache and forward the object 10 to the requesting user terminal 12, thus eliminating the need for receiving the object from the remote server 18 and allowing for quick retrieval of objects.

A drawback of the prior art caching arrangement is that the content stored in the proxy server 16 often may not consistent with contents of an object or file stored in the remote server 18. For instance, the object may have been updated at the remote server 18 while the proxy server 16 continues to store a non-updated version of the object.

As described on page 4, lines 15-22 of the specification, one prior art attempt to solve this problem involves the proxy server contacting the remote content server every time the proxy is accessed to assure that the data in the proxy server is consistent with the content in the remote server. However, this solution adds additional round trip connection to the remote servers, which adds considerable delay to servicing user requests and increases network traffic and workload of the content servers.

The background section of the application goes on to note another prior art solution, beginning at line 23 of page 4, in which an object is cached in the proxy server only for a predetermined time period. After the period of time has lapsed, the proxy server evicts the object from its cache. Disadvantages associated with this solution include no assurance that the object data is consistent between the content server, and undesirable eviction of an object after a lapse of such predetermined time period when the cached object at the time of eviction is consistent with the object in the content server.

Independent Claim 1

In light of the foregoing, and as generally summarized in the discussions beginning at line 15 on page 6 of the application and at the top of page 9 of the application, in a data access network system that includes a content server coupled to a plurality of proxy servers via an interconnect network, a system of maintaining content consistency between server and proxy servers includes a subscription manager in the content server for specifying all of the proxy servers that are subscribed to a content file stored in the content server. The system of maintaining

content consistency also includes a consistency manager in the content server for notifying all of so subscribed proxy servers that cache the content file when the content file is updated in the content server to discard the cached content file from those proxy servers.

For instance, referring the Figure 2, a data access network system 100 is illustrated for implementing a content consistency scheme in accordance with an example of the present invention. Content servers in a master data service system 30 store content files that can be accessed by remote proxy data service systems, such as proxy data service system 32. An exemplary data access network system 100 can include a number of master data service systems 30 and proxy service data systems 32.

A subscription manager 40 is provided in the master data service system 30 to specify all proxy servers, such as proxy data service system 32, that consistently cache the content file and that are subscribed to the cached content file. The content consistency scheme of Figure 2 employs a consistency manager 41 to enforce the content consistency scheme. When content of the content file is updated, deleted, or changed in the content servers of the master data service system 30, the consistency manager 41 notifies those proxy data service systems 32 which are subscribed to the content file to discard the cached content file.

For instance, in accordance with the exemplary Figure 2 system, a user at terminal 33 can access the services provided by the data service system 30 via the proxy data service system 32 and the Internet 31 (see last paragraph on specification page 11). As described on specification page 13, data service system 30 includes a content storage 43, a core engine 42 and an object manager 44.

Components 42-44 implement servers that offer data services of the data service system 30. As described on page 14 of the specification, the subscription manager 40 and consistency manager 41 maintain content consistency between the content files stored in the content storage 43 of the master data service system 30, and the same content files which have been cached in caches, such as cache 50 of the proxy data service system 32.

Dependent Claim 2

The subscription manager generates a subscription list that specifies all of the subscribed proxy servers that cache the content file when the subscription manager is notified by each of the proxy servers that it has cached the content file. As described in the last paragraph on specification page 17, when content is retrieved from the master data service system 30 and cached in proxy data service system 32, a subscription manager 51 can determine if content consistency needs to be applied to the cached content file. If so, subscription manager 51 sends a subscription request to subscription manager 40 of the master data system 30. Subscription manager 40 can acknowledge the request and add the request to the subscription list maintained by the subscription manager 40 for the cached content file.

Dependent Claim 3

In another aspect of the invention, a new protocol, built on the HTTP protocol, includes notification to the content server that a content file has been cached and to request a subscription for the content file in the content server. (See, page 17, lines 2-8 and lines 11-13.) This involves a proxy server notifying the subscription

manager that it has cached the content file via an HTTP GET request with a SUB (Subscription) header when the proxy server decides that the content file should be subscribed.

Dependent Claim 4

The application also describes that another aspect of the invention involves a condition where if the proxy server decides that the content file is not a popular file, then that proxy sever does not notify the subscription manager that it has cached the content file. As discussed in the application in the discussions beginning at line 24 of page 17, and as shown in Figure 2, the subscription manager 51 of the proxy data service system 32 decides whether it is needed to apply the content consistency scheme, and thus send to a master data service system a subscription request for a content file cached in the proxy server, based on whether the cached content file is popular or not.

Dependent Claim 5

A further aspect of the invention, discussed beginning at line 2 of page 17, involves the consistency manager notifying each of the subscribed proxy servers via a DWS INV message when a content file has changed. As described therein, a new protocol is built on the known HTTP protocol includes a new header extension, DWS INV, to an existing HTTP request. For example, the consistency manager 41 of the master data service system 30 will generate an invalidation message (i.e., DWS INV) upon modification or change to the cached content file.

Dependent Claim 6

Another aspect of the invention involves the consistency manager also sending an updated content file to each of the proxy servers via an HTTP PUT request with a DWS SUB header. As described in the specification starting at line 2 of page 17, and as shown in Figure 3, a new protocol built on the HTTP protocol includes a HTTP PUT request having a DWS SUB header extension. Lines 21-23 of page 17 describes that a HTTP PUT DWS SUB request notifies all of the proxy data service systems on the subscription list to discard the cached content file and also sends the updated content file to those proxy data service systems.

Dependent Claim 7

A further aspect of the invention discussed beginning at line 17 of page 16 and line 8 of page 19 of the application involves the consistency manager notifying all of the proxy servers specified by the subscription manager to discard the cached content file from the proxy severs when the content file is updated or deleted in the content sever within a predetermined time interval. This predetermined time is a type of "lease," which provides a simple and robust way to limit the amount of state that must be kept by the content server. For instance, as described in the last paragraph of page 16 and page 19, lines 8-12, content files stored in the proxy data service system 32 are guaranteed to be consistent with counterparts stored in the master data service system 30 within a predetermined time interval. Such predetermined time interval also provides for an efficient mechanism for cleaning up subscription information stored at the content server. For instance, as described in the paragraph spanning pages 19 to 20, when the time interval has elapsed, the

subscription manager 40 can clear a subscription list to provide a network-efficient mechanism for cleaning up the subscription list.

VI.   Grounds of Rejection to be Reviewed

The final Office Action presents the following two grounds of rejection for

review on this appeal:

1.   The rejection of claims 1-3, and 5-7 under 35 U.S.C. § 103, as being unpatentable over the Holt, III patent (US 6,324,565, hereinafter, "Holt") in view of the Smith et al. patent (US 6,377,991, hereinafter, "Smith"); and

2.   The rejection of claim 4 under 35 U.S.C. § 103, as being unpatentable over the Holt, III patent in view of the Smith et al. patent in further view of the Aggarwal et al. patent (US 6,012,126, hereinafter "Aggarwal").

VII. Argument

The Manual of Patent Examining Procedure, at Section 2143, sets forth three basic criteria for establishing a *prima facie* case of obviousness. At issue on this appeal is the third of those criteria, namely "[t]o establish prima facie obviousness of a claimed invention <u>all</u> the claim limitations must be taught or suggested by the prior art. *In re Royka*, 490 F.2d 981, 180 USPQ 580 (CCPA 1974)." MPEP §2143.03 (emphasis added). The final rejection merely discusses the claim limitations in general terms, with broad, vague references to the Holt and Smith et al. patents. It fails to identify how the references teach or suggest a number of the specific features of the claims.

The differences between the present invention and the cited documents become apparent upon a detailed analysis of representative claims.

A. Independent Claim 1.

Claim 1 stands finally rejected as being unpatentable over the Holt patent in view of the Smith patent. The rejection is respectfully traversed, as none of the documents relied upon by the Examiner teach or suggest Appellants' invention as set forth in claim 1. For instance, claim 1 recites a system in a data access network system having, among other features, a subscription manager *in a content server* for specifying all of the proxy servers *that are subscribed to a content file* stored in the content server. Claim 1 also recites a consistency manager *in the content server* for notifying all of *so subscribed proxy servers* that cache the content file when the content file is updated in the content server to discard the cached content file from those proxy servers.

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The foregoing features are neither taught nor suggested by the documents relied upon by the Examiner, and the remarks set forth by the Examiner in numbered paragraph 3 of the Office Action (which are repeated on page 2 of the Advisory Action dated June 28, 2004), do not address the shortcomings of these documents.

The Holt patent is directed to a system for dynamically generating documents, wherein an intermediate server retains or caches document programs and data received from a content providing server. When the intermediate server next requires the document, it can be generated at the intermediate server rather than acquiring it from the content providing server. According to Holt, a register is retained in the content providing sever of all intermediate servers that have received document programs or data. (See column 4, lines 8-9 and the abstract, lines 12-14.) If changes to the document program or data occur, they are *broadcast* to all the intermediate servers by the content providing server. That is, the content server in Holt notifies *every* server that ever cached data from it. Hence, Holt does not teach or suggest the concept of a proxy server *subscribing to a content file* in the context of the present invention.

On page 4 of the final Office Action, the Examiner acknowledges that the Holt patent "does not explicitly disclose the subscription manager in the content server for specifying all of the proxy servers list that are subscribed to a content file stored in the content server as claimed." The Examiner, therefore, relies on the Smith patent for allegedly teaching these features. However, Appellants respectfully submit that the Smith patent does not remedy the acknowledged shortcomings of Holt. Additionally, Appellants submit that Smith does not teach or suggest the claimed features of a subscription manager *in a content server* for specifying all of the proxy

servers *that are subscribed to a content file* stored in the content server, which also

are absent in the Holt patent. The differences between the claimed invention and

the proposed combination of Holt and Smith are now discussed.

On page 4 of the Action, the Examiner asserts that the Smith patent discloses

"the claimed proxy server (cache proxy server, definition of cache proxy server is

subscribing cache from cache server) array configured to a distributed cache to

proxy server." The Examiner asserts on page 5 of the Office Action that a

"membership list" disclosed by Smith "specifies all of the proxy servers that are

subscribed to a content file. The Examiner then concludes:

> Therefore, it would have been obvious to a person having ordinary skill in the
> art at the time the invention was made to include the subscription manager in
> the content server for generating and specifying all of the proxy servers list
> that are subscribed to a content file stored in the content server taught in
> Smith in the system of Holt to provide proxy server list [sic]. Because the list
> of proxy servers provides quick data access by using the member of proxy
> servers to check and access member of proxy server to get cache information
> from the member proxy server [sic].

In the remarks set forth in numbered paragraph 3 of the Office Action, the

Examiner concludes in the last sentence:

> Thus, Holt and Smith combined disclose or suggest the content server does
> specify all proxy server that subscribe to content file in content server and the
> content server notifying subscribed proxy servers that cache content file is
> updated in the content server to discard the cache content file to the proxy
> servers.

Appellants assert there is no motivation or suggestion that would have led one

of ordinary skill to the combination of the Smith and Holt documents in the manner

suggested by the Examiner. Moreover, even if one were to consider, *arguendo*, that

these documents could have been combined in the manner suggested by the

Examiner, such combination would not have resulted in the presently claimed

invention. Smith's membership list is a list of all proxy servers in an organization. At

best, any combination of these teachings would perhaps have resulted in using

Smith's membership list *in each proxy server* of the entire array of servers in an

organization in Holt's broadcast scheme. Neither of these documents, alone or in

combination, teach or suggest Appellants' claim 1 combination which includes,

among other features, a subscription manager *in the content server* for specifying all

of the proxy servers *that are subscribed to a content file* stored in the content server,

nor do these documents teach or suggest all features of Appellants' claimed

"consistency manager."

The Smith patent is directed to having multiple proxy servers act as a single

cache, with a single copy of each object being stored among the various servers

(see, column 2, lines 33-46). The disclosed system is directed to accessing the

server most likely to store a given object (see column 4, lines 36-43). Column 10,

lines 15-23 are cited by the Examiner and refer to a "membership list." However, this

is a list of all proxy servers in the proxy server array; *not* all the proxy servers that

subscribed to a particular content file, as claimed (see, column 7, lines 43-46).

In addition, the "membership list" of Smith is not used by a consistency

manager for notifying subscribed proxy servers of updates in a content file. Rather,

the "membership list" resides *in the proxy servers* and is used to keep track of *all*

proxy servers that are included in the proxy array. (See, column 4, lines 60-67.)

The Smith patent discloses a Cache Array Routing Protocol (CARP) for use in

a system having multiple proxy cache servers. CARP is directed to avoiding

duplication of content across multiple physical caches. In contrast, exemplary

embodiments of the present invention are directed to exactly the opposite type of

operation. In the present invention, a cache at each of multiple locations can contain

an exact duplicate of information, and the disclosed system is directed to providing consistency between the different locations. In addition, the CARP membership algorithm disclosed by Smith indicates a proxy server that would cache an object if it was available, but does not indicate if the object has ever actually been cached at that proxy server. Thus, when an object update occurs, it can be sent to a proxy server even if the proxy server never cached that file.

Thus, the Holt and Smith patents, considered alone or in the combination relied upon by the Examiner, fail to teach or suggest the combination of features recited in claim 1 including a subscription manager *in a content server* for specifying all of the proxy servers *that are subscribed to a content file* stored in the content server. In addition, these documents fail to teach or suggest a consistency manager *in the content server for notifying* all of so subscribed proxy servers that cache the content file *when the content file is updated* in the content server to discard the cached content file from those proxy servers. As such, the rejection of claim 1 should be reversed because a *prima facie* case of obviousness has not been established.

B.   Dependent Claims 2-4

Claim 2 depends from claim 1 and recites that the subscription manager generates a subscription list that specifies all of the subscribed proxy servers that cache the content file when the subscription manager is notified by each of the proxy servers that it has cached. In rejecting claim 2, the Examiner states: "definition of cache proxy server is subscribing cache from cache server," at the penultimate line of page 4 and the third line of page 5. However, these statements are not supported

by a reference or other teaching that would support his allegation that the "membership list" of Smith specifies all of the proxy servers that are subscribed to a content file in the context in which this feature is recited in claim 1. Moreover, the Examiner does not provide any citation from Smith or elsewhere that would support a teaching of a subscription manager *in the content server* that "generates a subscription list ... *when the subscription manager is notified by each of the proxy servers* that it has cached the content file," as claimed. The rejection, therefore, fails to teach or suggest the combination each and every claimed feature set forth in claim 2.

Claim 3 depends from claim 2 and further specifies that a proxy server notify the subscription manager that it has cached the content file via an HTTP GET request with a SUB (Subscription) header when the proxy server decides that the content file should be subscribed. In connection with these features, the Examiner refers to column 3, line 62 to column 4, line 23 of Holt. However, as pointed out by the Examiner, the Holt patent does not disclose the claimed subscription manager. Moreover, the cited part of Holt relied upon by the Examiner fails to mention anything with regard to an HTTP request including a SUB header. Hence, the Holt patent also does not teach or suggest notification of the subscription manager via a HTTP GET request with a SUB (Subscription) header. Furthermore, the Holt patent does not mention or even remotely suggest that a proxy server operates to decide whether a content file should be subscribed as claimed.

With respect to the rejection of dependent Claim 4, the Examiner acknowledges that neither Holt nor Smith disclose the feature of "[if the proxy server

decides that] the content file is not a popular file, then that proxy sever does not notify the subscription manager that it has cached the content file." (See the final Office Action, the last paragraph of page 6.) To address these deficiencies in Holt and Smith, the Examiner cites the Aggarwal patent for disclosing an admission control logic that uses a popularity criterion. However, claim 4 depends from claim 3, and thus ultimately depends from independent claim 1. It is respectfully submitted that the Aggarwal patent does not remedy the shortcomings of the Holt and Smith et al. patents pointed out above for independent claim 1. For at least this reason, claim 4 is allowable.

Additionally, it is submitted that the logic described in the cited parts of Aggarwal (i.e., column 3, line 63 to column 4, line 13), which concern admitting an object to a cache "only if it appears on the popularity list ..." (column 4, lines 10-11), does not relate to the claimed condition that "if the proxy server decides that *the content file* is not a popular file, then the proxy server does not notify a subscription manager *that it has cached the content file*." Indeed, it appears that the "Admission Control Logic" of the system of Aggarwal would *prevent* admission of an object determined not to be popular to the proxy's cache. Hence, the proxy server of Aggarwal would never cache such a file. Thus, the Aggarwal patent actually *teaches away* from any *cached* content file decided not to be a popular file. It is respectfully submitted, therefore, that the combined disclosures in Holt, Smith and Aggarwal would not have led one to a system of maintaining consistency between the content servers and the proxy servers having the additional features recited in Claim 4.

For these reasons, claims 2-4 recite subject matter defining further points of distinction not taught or suggested in the applied documents. As such, the rejection

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of dependent claims 2-4 should be withdrawn.

C.   Dependent Claims 5 and 6

Claim 5 depends from claim 1 and recites that the consistency manager notifies each of the subscribed proxy servers via a DWS INV message when a content file has changed. On page 6 of the final Office Action, the Examiner asserts that the Holt patent discloses these features of claim 5 at column 3, line 38 to column 4, line 45 and column 6, lines 11-40. However, as pointed above with respect to claim 1, the Holt patent does not teach or suggest the claimed consistency manager for notifying all *subscribed proxy servers*, whether considered alone or in the proposed combination with the Smith patent. Hence, it is submitted that the cited documents do not teach or suggest that *a consistency manager in the content server* notifies *subscribed proxy servers* upon the occurrence of a change in a cached content file. Nor does the cited portion teach or suggest sending an HTTP invalidation message DWS INV notifying all *subscribed* proxy servers to discard the changed cached content file, as set forth in claim 5. Accordingly, claim 5 recites additional features not taught or suggested in the cited Holt and Smith patents. As such, the rejection of claim 5 is improper and should be reversed.

Claim 6 depends from claim 1 and further specifies that the consistency manager also sends an updated content file to each of the proxy servers via an HTTP PUT request with a DWS SUB header. In connection with this claimed feature, the Examiner again refers to column 6, lines 11-40 of the Holt patent, which discloses that a content server "may notify all other servers on which the data have been cached ..." (column 6, lines 12-13). As pointed out above, however, the Holt

system does not include a subscription manager *in a content server* that operates to

specify all proxy servers that are *subscribed* to a content file. Rather, the content

server in Holt notifies every server that ever cached data from it. The concept of a

subscription to a content file as claimed is not discussed or even hinted in the Holt

patent, whether this patent is considered individually or in combination with the Smith

patent. Hence, Appellants submit that it necessarily follows that the cited documents

also fail to teach or suggest sending an updated content file, via an HTTP PUT

request with a DWS SUB (i.e., subscription) header, to each proxy sever *subscribed*

to that content file. Therefore, the rejection of claim 6 does not establish a *prima*

facie case of obviousness. As such, the rejection should be reversed.

D.   Dependent Claim 7.

Claim 7 depends from claim 1 and recites that the consistency manager

notifies all of the proxy servers specified by the subscription manager to discard the

cached content file from the proxy severs when the content file is updated or deleted

in the content sever within a predetermined time interval. In setting forth the

rejection, the Examiner refers to column 1, line 46 to column 2, line 12 of Holt, and

states:

> With respect to claim 7, Holt discloses, the consistency manager notifies all of
> the proxy servers specified by the subscription manager to discard the cached
> contents file from the proxy servers when the content file is updated or
> deleted in the content server within a predetermined time interval.

Appellants disagree.

The cited part of Holt states: "the <u>intermediate server</u> destroys documents

after a predetermined period of time or may destroy a document if a request for that

document has *not been received within a certain period of time.*" See column 1,

lines 53-56. Here, Holt's description pertains to actions that are performed by the intermediate server *after* a time period has lapsed. It does not relate to notification by a consistency manager *in the content server*, much less notification by such a consistency manager *within a predetermined time interval* as claimed.

The cited passage also describes that "in other systems, the content providing server will notify <u>any</u> caching intermediate severs when a document has been altered or the intermediate sever will request assurance that the document has not been changed prior to transmitting its own cached copy of the document" (emphasis added). See column 1, lines 59-64. It is respectfully submitted that such notification disclosed in Holt is neither performed in connection with *a predetermined time interval* nor is it performed by a consistency manager to all *subscribed* proxy servers *specified by a subscription manager*, as claimed.

As pointed out above, the concept of a "lease" is provided by the claimed predetermined time interval to overcome deficiencies of previously used content consistency schemes. For instance, notification of changes to the content file by the content server to subscribed proxy servers *within a predetermined time period* assures each proxy that the cached content file is consistent during that time period, thus avoiding any need for a proxy server to check with the content server every time the proxy server is accessed. Moreover, such a lease provided by the a predetermined time interval overcomes disadvantages associated with systems in which a proxy server caches objects received from a content server for only a predetermined period of time during which no content consistency assurance is provided. Another capability provided by the claimed predetermined time interval is that it provides for an efficient mechanism for cleaning up subscription information

stored at the content server when the time interval has elapsed. In contrast, Holt describes no method for canceling old subscriptions. As acknowledged by the Examiner, the Holt patent does not even teach or suggest a subscription manager as claimed.

For at least these additional reasons, therefore, the subject matter of claim 7 is not taught or suggested by the Holt and Smith patents. As such, a *prima facie* case of obviousness has not been established. Accordingly, the rejection should be reversed.

VIII. Conclusion

As can be seen, the references relied upon in the various grounds of rejection do not disclose the subject matter recited in the claims against which they have been applied. Therefore, the rejections are not properly founded in the statute and should be reversed.

Respectfully submitted,
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Appendix A – The Pending Claims

1.   In a data access network system that includes a content server coupled to a plurality of proxy servers via an interconnect network, a system of maintaining content consistency between the content server and proxy servers, comprising:

a subscription manager in the content server for specifying all of the proxy servers that are subscribed to a content file stored in the content server, and

a consistency manager also in the content server for notifying all of so subscribed proxy servers that cache the content file when the content file is updated in the content server to discard the cached content file from those proxy servers.

2.   The system of claim 1, wherein the subscription manager generates a subscription list that specifies all of the subscribed proxy servers that cache the content file when the subscription manager is notified by each of the proxy servers that it has cached the content file.

3.   The system of claim 2, wherein a proxy server notifies the subscription manager that it has cached the content file via an HTTP GET request with a SUB (Subscription) header when the proxy server decides that the content file should be subscribed.

4.   The system of claim 3, wherein if the proxy server decides that the content file is not a popular file, then that proxy sever does not notify the subscription manager that it has cached the content file.

5.   The system of claim 1, wherein the consistency manager notifies each

of the subscribed proxy servers via a DWS INV message when a content file has

changed.

6.   The system of claim 1, wherein the consistency manager also sends

an updated content file to each of the proxy servers via an HTTP PUT request with a

DWS SUB header.

7.   The system of claim 1, wherein the consistency manager notifies all of

the proxy servers specified by the subscription manager to discard the cached

content file from the proxy severs when the content file is updated or deleted in the

content sever within a predetermined time interval.

Appendix B – Evidence

(None)

Appendix C – Related Proceedings

(None)